ENGINEERING

STANDARDS

For Public Works in Conjunction with the Development of Subdivisions, Commercial & Industrial Property

City of Rochester
Public Works Department

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Section 1001 SCOPE

1001.1 Description

In order to standardize engineering requirements for Developers and Engineers performing work within the City of Rochester, it is important that certain guidelines be followed.

These guidelines outline certain requirements, materials, and standards that shall be incorporated into the preparation of plans and specifications for sanitary sewer, storm sewer, storm water treatment ponds, watermains, service connections, pedestrian facilities, street construction, and associated erosion control within the Rochester Urban Service Area, unless otherwise authorized by the City Engineer.

Compliance with these guidelines will help provide quality projects and assure uniform performance standards for the citizens of Rochester.

1001.2 Engineering Requirement

As set forth in various sections of City ordinances, developers of property within the City are required to submit certain professionally prepared and signed plans and specifications for review and approval by the City. These include such items as grading plans, drainage reports, topographic surveys and plats, street and utility plans and specifications.

All plans and specifications for construction of public works shall be prepared by or under the direction of a Professional Engineer (herein after "Engineer") licensed under the laws of the State of Minnesota.

The Engineer shall be responsible for the accuracy and completeness of the plans and specifications and the thoroughness and quality of the field inspections. The Engineer shall be familiar with the Rochester Code of Ordinances (as they relate to public works), the City of Rochester Standard Specifications and the Minnesota Department of Transportation Standard Specifications for Construction.

The City Engineer will review the plans for general compliance with department practice. Approval of the plans and specifications by the City does not relieve the Engineer of full responsibility for the adequacy of design or accuracy of computations and details.

Engineering services include; preparation of plans and specifications, field staking and resident inspection in order to assure the City that the completed project is in conformance with the approved plans and specifications, and submission of record drawings.

1001.3 Definition of Terms

A. Public Works

Public Works as used herein are defined as those facilities for transportation, conveyance of sanitary and storm flows and potable water that are constructed within the public right-of-way or on public easements for the use of the general public. The Public Works Department is that department of the City of Rochester responsible for the management and oversight of Public Works facilities.

B. "ROCOG"

Rochester-Olmsted Council Of Governments, 2122 Campus Drive SE

C. Engineer

Engineer as used herein is defined as Professional Engineer licensed under the laws of the State of Minnesota.

D. City Engineer

City Engineer as used herein is defined as the Rochester City Engineer or his / her designee, the Manager of Engineering.

E. Developer

Developer as used herein is defined as a person, company, corporation, or limited partnership that develops property within the City of Rochester that is served by Public Works facilities.

1001.4 Reference Documentation

The following reference documentation shall be the latest edition, including amendments and published updates.

1. Minnesota Department of Transportation (Mn/DOT)
   (a) Standard Specifications for Construction
   (b) Standard Detail Plates

2. Great Lakes-Upper Mississippi River Board of State and Provincial Health and Environmental Managers
   (a) Recommended Standards for Wastewater Facilities
   (b) Recommended Standards for Water Works

3. Minnesota Department of Health;
   (a) Chapter 4715 Plumbing Code
   (b) Chapter 4720 Public Water Supplies
   (c) Chapter 4715 Wells & Borings
   (d) Chapter 4715 Explores & Exploratory Borings

4. City of Rochester
   (a) Standard Specifications for Street and Utility Construction
   (b) Standard Detail Plates
   (c) Grading Plan Checklist
   (d) Building and Fire Prevention Code
   (e) Ordinances

5. Rochester Public Utilities Water Service Rules and Regulations

6. Rochester-Olmsted Council Of Governments (ROCOG) Thoroughfare Plan

Section 1002 ROADWAY DESIGN

1002.1 Right-of-Way & Street Widths

For classification of streets and resulting minimum widths refer to the "Thoroughfare Plan" as set by ROCOG.

The City of Rochester Standard Detail Plates contains street widths for typical ROW.

On cul-de-sacs (without parking) the minimum radius to back of curb shall be 40.5 feet.

1002.2 Typical Cross-Section

Cross-slope – maximum 3% on driving lanes, 2% to 5% on parking lanes, 3% to 5% on boulevards.

A 2' clear zone area shall be provided from the face of curb to the face of any obstruction.

Sidewalk location – 1' from property line for streets with a right of way width of more than 56', 0.5' from property line for streets with a right of way width of 56' or less.

1002.3 Curbing

All streets shall be constructed with concrete curb and gutter on both sides of the street.

Curb and gutter shall be design B-624 in all commercial/industrial streets, all multi-family residential (more than 2 families per dwelling unit), all streets centerline grade of 8% or steeper, all intersection radii, at drainage structures, and on residential streets that are platted as 'Controlled Access' (or similar restriction).

Minimum longitudinal slope on curbing is 0.4%. Minimum longitudinal slope on curbing for streets leading to a cul-de-sac is 0.5%. The minimum longitudinal slope on curbing for the radial portion of a cul-de-sac is 1%.

4" drive over concrete curb and gutter will be permitted at one and two family residential areas where driveway locations have not been established and street grades are less than 8%.

Pedestrian ramps shall be placed at all intersection corners.

Where sidewalk abuts curb, the curb shall be modified to include a sill on the back on which the walk will rest.

Expansion joints shall be placed at the ends of all curved sections, at the ends of the curved portions of street returns, at drainage structures and where abutting other concrete. The spacing of joints shall not exceed 300 feet.

1002.4 Vertical and Longitudinal Controls

Reference – Roadway and Subdivision Design Standards in the City of Rochester Zoning Ordinance 64.200.

2% maximum longitudinal grade through intersections.

1002.5 Pavement Design

Unless otherwise directed by the City Engineer, the following pavement design shall be used:

The minimum structural sections for flexible pavements are as follows:

1. Local Streets – 7 Ton design, 4" bituminous surfacing with a total G.E. of 13 inches
2. Collector Streets – 9 Ton design, 4" bituminous surfacing with a total G.E. of 18 inches
3. Arterial Streets – 10 Ton design, 6" bituminous surfacing with a total G.E. of 24 inches

Rigid pavement (concrete) shall be considered on 10-ton design streets. All rigid and flexible pavements shall be designed in accordance with the procedures set forth in the Pavement Manual of the Minnesota Department of Transportation.

The pavement design shall be based on a soils investigation and analysis, which shall consider the supporting strength of the subgrade (R-value) to be used in design. Recommended measures shall be provided for special conditions such as excess moisture or highly expansive soils. If you chose to use a higher R-value than 10, or are constructing a 10-ton street, a soils report shall be prepared including; soil boring log, R-value test results, and pavement design.

1002.6 Future Side Streets

Where accesses to future subdivision of adjacent land are shown on the plans, right-of-ways and all roadway improvements including, pavement, curb and gutter, and utilities on the side street, shall be constructed and extended to the end of the side lot or the boundary of the development whichever is greater. Projected profiles and alignments of the future street shall be shown on the plans.

1002.7 Temporary Dead-End Streets

All temporary dead-end streets shall be closed with temporary barricades (MnDOT 8002F) and are to be fully reflectorized and properly maintained until the street is extended. Temporary cul-de-sacs are required unless waived by the City Engineer. Proper erosion control measures shall be taken to prevent soil erosion at the dead-end.

1002.8 Temporary Secondary Access

Where Temporary Secondary Access to subdivisions are shown on the plans, right-of-ways and all roadway improvements shall include

1. Minimum driving surface width of 20 feet.
2. Minimum design Alignment and Profile of 15 mph.
3. Minimum surface section Aggregate Base of 8 inches, to remain passable throughout the year,
4. The surface shall be paved within 200 feet of any public roadway.
5. Erosion control measures shall be taken to prevent soil erosion.
6. Roadway maintenance of a passable access until the future permanent secondary access is extended to the subdivision.

1002.9 Drive Approaches

See standard detail plates for requirements.

1002.10 Location of Utilities

The general criteria for placement of utilities within the right-of-way is as follows:

Material	Horizontal Alignment	Vertical Depth
Sanitary Sewer*	Center of Street or, maximum 5.5’ from center on curvilinear streets	6 ft over top
Watermain*	10' Clear and Parallel, north and east, to Sanitary sewers	7ft over top
Storm Sewer*	5’ - 10' Clear and Parallel, south and west, to Sanitary Sewer.	2ft over top
Subdrain	Both sides of street behind curbs	3.5 ft over top
Electric Telephone Cable TV	Easement adjacent to ROW	3 ft
Gas	In boulevard between curb & walk.	3 ft

* Sanitary Sewer, watermains, and storm sewer are generally to be kept within the paved street area. In no case shall the sewer or watermain be placed within 3 feet of the lip of gutter. Public sewer and watermains outside the public right-of-way are to be located in dedicated public easements. Landscaping features should be kept outside utility easement areas in order to facilitate future utility maintenance activity.

Water service lines are not to be connected to the looping portion of watermains located outside public right-of-way.

1002.11 Utility Conduit Crossings

Utility ducts shall be constructed according to the Detail Plates and placed across streets at locations provided by the Rochester Public Utility Electric, Telephone, Gas, and Cable TV companies. The Engineer shall include the ducts on the plans and special provisions. The utility shall make arrangements with the developer to cover the costs of the ductwork.

1002.12 Utility Easements

Where public sanitary sewer, watermain, storm sewer, or subdrain is outside of platted ROW, the horizontal distance from the pipe to the edge of the easement shall be at least 10’ or at least equal to the depth of the pipe, whichever is greater. The minimum easement width shall be 20’.

1002.13 Pedestrian Facilities

A. Sidewalks

All streets are to have a sidewalk berm on both sides. Pedestrian curb ramps shall be constructed at all quadrants of intersections. All driveways are constructed with a sidewalk section. Where

sidewalks do not allow for sufficient boulevard width to maintain vegetation, boulevards shall be paved with materials approved by the City Engineer.

Widths:

1. 5’ wide on all commercial/industrial streets and all residential streets with a right of way width of more than 56’.

2. 4’ wide on residential streets with a right of way width of 56’ or less and on cul-de-sacs of 20 dwelling unit or less.

B. Bikeways

Bikeways shall conform to the AASHTO “Guide for the Development of Bicycle Facilities”.

Bikeways shall conform to Minnesota Department of Transportation State Aid Standards.

Bikeways are to be 10' wide with 2’ recovery area on both sides, and sloped to drain toward the drainage way or gutter.

Section 1003 Sanitary Sewer Design

1003.1 Sizing Sanitary Sewers

Sizing of sanitary sewers shall be 8" minimum.

All sewers shall be designed to have sufficient slope to provide mean velocities of not less than 2 fps based on Manning's formula using an N factor of 0.013. Sizing to be reviewed by the City Engineer prior to final plans preparation.

The City shall reimburse the Owner/Developer for the incremental cost of the materials to increase the size of the sanitary sewer above an 8" diameter pipe if requested by the City Engineer. The City shall also reimburse the required incremental cost of the increase in the width of the manhole size if it is solely required for the oversize sanitary trunk sewer pipe. The Public Works Department shall establish the reimbursement amount for each item concurrent with the adjustments in the City's standard rates, which occur August 1st of each year. Invoices for such reimbursements, together with supporting information, are to be submitted to Rochester Public Works for processing, verification and payment.

1003.2 Pipe Material

Watermain quality pipe shall be used in all common trench installations.

Sanitary sewers passing over or under watermains shall be constructed of materials equal to watermain standards of construction for a distance of nine feet on either side of the watermain.

Sanitary sewers crossing watermains or storm sewers shall be constructed with adequate structural support to prevent excessive deflection of joints, or settling on the watermains or storm sewer.

1003.3 Spacing and Alignment

Sanitary sewers shall be placed on tangent alignment with manholes at changes in pipe size, horizontal alignment and/or vertical alignment. Spacing of manholes shall not exceed 400 feet for pipelines 8-15" diameter and 500' for pipelines 18-30" diameter.

Outside drop manholes shall be constructed at locations where the difference in inlet and outlet elevations exceeds 1' (one foot).

Changes in flow direction at manholes shall not exceed 90 degrees.

4" and 6" Service connections to the sewer main shall only be considered at locations in-between 2 manholes (exceptions are cul-de-sac's). 8" or larger services should be connected at a manhole. Lamp holes shall not be installed at the end of sanitary sewers.

Section 1004 Watermain Design

1004.1 Sizing Watermains

Standard watermain size for water distribution system design is eight (8) inch diameter.

Looping of watermains is required in all cul-de-sacs and dead end streets unless topographic conditions make it impractical. Watermains are to be extended to the end limits of new subdivisions to facilitate future water system extensions and looping. Six (6) inch diameter watermains may be allowed for short (less than 150 feet long) unavoidable dead-ends or short looped areas if the design will provide minimum required fire flows at minimum allowable pressure.

Twelve (12) inch or larger diameter watermains may be required by the City Engineer based on watermain hydraulic capacity requirements to serve future adjacent portions of the water distribution system. Proposed watermain sizing is to be reviewed with Rochester Public Utilities prior to final plan and specification preparation.

Rochester Public Utilities (RPU) will reimburse the Owner/Developer the incremental cost for constructing over-sized mains, valves and fittings larger than 8" diameter if requested by the City Engineer. The Public Utilities Department (RPU) will annually establish the maximum allowable oversize reimbursement amount for oversize items Invoices for such reimbursements, together with supporting information, are to be submitted to Rochester Public Utilities for processing, verification and payment.

1004.2 Pipe Material

Watermain shall be ductile-iron pipe complying with (W200) "Watermain Specifications", Standard Specifications for Street and Utility Construction, Rochester, Minnesota.

Polyethylene encasement shall be incorporated when soil conditions warrant. Procedures are delineated in AWWA C105, Appendix A. Soil samples suitable for resistivity pH, redox potential, and sulfide testing are to be collected at the time project soil borings are completed, the test results are to be included in the project geotechnical report. The report is to include appropriate recommendations for or against polyethylene encasement based on the point-system guidelines provided in Table A.1 of AWWA C105, as well as other more qualitative factors such as soil moisture content, soil description, potential stray direct current and experience with existing installations.

1004.3 Spacing and Alignment

Watermains designed for connection to the Rochester municipal water system must comply with Minnesota Department of Health (herein after "Health Department") standards. All such watermain plans and specifications are to be reviewed and approved by the Health Department prior to construction. Review and approval of these plans and specifications by Rochester Public Utilities is also required (before plan submission to the Health Department).

The description of the Minnesota Department of Health watermain, sanitary sewer and storm sewer separation requirements, which follows, is to be considered an aid to watermain designers to explain current requirements. The description is in no way intended to relieve the designer from meeting Health Department separation requirements.

1. Horizontal Alignment: Watermains are generally to be aligned parallel with sanitary sewers with a 10' minimum edge-to-edge separation from any storm or sanitary gravity sewer or force main. As noted in Section 1002 of these Guidelines, a 3' minimum edge-to-edge distance is to be maintained from the front lip of the concrete curb and gutter.

(a) Conditions permitting separation exceptions from gravity sewers: (No exceptions allowed from sanitary force mains)

1) Solid rock in trench
2) Narrow street pavement with multiple utilities

(b) Exception Procedure: The Engineer must submit to the Minnesota Department of Health supporting data and a request for the alignment exception along with the required plan and specification submittals and fees.

(c) Exception Details:

1) Water main quality pressure pipe sewer is required and must be pressure tested to ensure water tightness.

2) Water mains are preferred to be located above the sanitary sewer with a minimum vertical edge-to-edge separation of 18". Where this is not possible when passing a manhole structure, one full length of water main pipe shall be located so that both joints will be as far as possible away from the manhole structure. No contact with the manhole is allowed.

2. Vertical Alignment: Generally 7' minimum and 10' maximum bury from finished grade. A 6' bury may be allowed in certain unpaved areas such as stream crossings, narrow ditch crossings, etc. Future finished grade lines in unimproved areas must be determined and shown on the construction plans.

3. Sewer Crossings: Water mains crossing sewers shall be kept to a minimum. The crossings shall be aligned to be as nearly perpendicular as possible. Water mains are preferred to be located over the sanitary sewer with a minimum vertical edge-to-edge separation of 18". One full length of water main pipe shall be located so that both joints will be as far as possible away from the crossing.

(a) **Allowed Exceptions From Gravity Sewers: (No Exceptions Allowed From Sanitary Force Mains)**

Only where deemed impossible to maintain vertical separation and or full pipe length restriction.

(b) **Exception Procedure:** The Engineer must submit to the Minnesota Department of Health supporting data and a request for the alignment exception along with the required plan and specification submittals and fees.

(c) **Exception Details:**

Water main quality pressure pipe sewer is required and must be pressure tested to ensure water tightness.

4. Surface Water Crossings: Surface Water Crossings: Water mains crossing under surface waters greater than 15' in width must be provided with restrained joints from top of bank to top of bank. The restrained joints are to be called out on the plan sheet, and are to be considered an incidental pay item. Valves shall be located at both sides of the crossing within an accessible area above the water table not subject to flooding. No service connections are allowed between the isolation valves. A fire hydrant shall be located between the isolation valves in an accessible area to allow for pressure testing of the crossing to determine leakage.

Fire Hydrants: The Rochester Fire Prevention Bureau must approve all fire hydrant locations. Fire hydrants must be located at all street intersections, at the sides of all cul-de-sacs, at the end of all temporary or permanent dead-ends that include service connections, at the end of all dead-ends that are longer than 150' that do not have service connections and at all dead-ends created between water system pressure zones.

In residential areas with usable frontage, fire hydrants shall be spaced a maximum of 400' apart. Commercial and multi-family areas usually require closer hydrant spacing depending on lot width, lot depth and the location of the buildings to provide adequate fire protection to all sides of the buildings. In non-developed areas fire hydrants shall be placed at major high points to allow for air release and at intervals to allow for proper flushing and testing of the main.

System Valves: Valves must be located at all temporary dead-ends past the last service and a minimum distance of 20' before the temporary hydrant or if the end hydrant is permanent just past the hydrant tee, at all stub-outs, on loops at both ends where the water main exits the paved area.

At the split between pressure zones a valve shall be placed at both sides of the flushing hydrant to allow flushing from both directions.

Generally valves shall be located at intersections in line with the right-of-way lines for safer operation and located to allow a maximum 4-valve shutdown to isolate water main sections. Valves located mid-block shall be near a fire hydrant tee for reference and adequate flushing of the main. In residential areas valves shall be located such that no more that 24 customers would be isolated at a time in a shut down. In commercial areas fewer customers should be isolated depending on the size of the facility. Larger commercial/industrial facilities will require the installation of isolation valves on both sides of the service connection for improved reliability. In non-developed areas valves shall be located at anticipated intersections and or at intervals to allow for proper flushing and testing of the main.

Section 1005 Storm Sewer Design

1005.1 Drainage Plan

A Drainage Plan shall be prepared for each subdivision, or as required by zoning ordinance 61.550. The report shall address the impact on existing facilities and provide the basis of design for the storm drainage systems.

Specific items to be addressed in the Engineer's report include: present and future flows from off-site which will impact on the drainage systems, location and inlet capacity of the catch basins, sizing of the systems, design of ponds, capacity of downstream systems, etc. The Drainage Plan shall be signed by the Engineer.

The Engineer's report shall include depiction of all existing and proposed drainage areas referenced in the report. An on-site plan or map showing drainage areas for each catch basin or other collector shall be prepared at 1" = 100' or larger with finished contours at two (2) foot intervals; the storm sewer system shall be depicted, with pipe sizes labeled and structure numbering corresponding to numbering used in the design calculations. Existing and proposed pond drainage areas shall be depicted. Off-site drainage areas where 2' contours are not available may be shown on USGS maps or other suitable contour maps.

Stormwater Management Pond designs shall be modeled with computer software incorporating SCS Technical Release 20 (TR-20) or US EPA's Surface Water Management Model (SWMM). All printouts shall clearly indicate the respective location, storm event, and existing verses developed. The Engineer's report shall include: derivation of times of concentration and curve numbers, sizing of the pond permanent pool/water quality design, a table of the pond stage-storage-discharge information from the pond bottom up to the top of dam or 100-year high water level (whichever is higher), and derivation of the pond discharge verses stage data.

The report shall include a prepared summary of all computer printouts.

1005.2 Sizing Storm Sewer

Storm sewers shall be designed for the 10-year frequency storm without surcharging of pipes, with a safe overflow provided for the 100-year frequency storm. Sizing shall address future flows from off-site. Rational or SCS methods may be used for run-off with pipe capacity determined by Manning's formula. Sizing of storm sewers shall be 12" minimum.

1005.3 Pipe Material

Storm sewers shall be constructed of reinforced concrete pipe within the paved roadway section and in locations subject to heavy vehicle loading during construction, maintenance, or use. Storm sewers in other areas may be constructed of

(a) Dual Wall Corrugated Polyethylene,
(b) Polyvinyl Chloride,
(c) Corrugated Steel,
(d) Ductile Iron

in accordance with the City of Rochester Specifications for storm sewer construction.

Storm sewers crossing watermains or sanitary sewers shall be constructed with adequate structural support to prevent excessive deflection of joints, or settling on the watermains or sanitary sewer.

1005.4 Outlet Structures

Riprap and/or energy dissipaters shall be required for all sizes to prevent erosion.

1005.5 Spacing and Alignment

Storm sewers shall typically be placed on alignments parallel with sanitary sewer, with manholes at changes in horizontal and/or vertical alignment. Manhole spacing shall not exceed 400 feet for 12”-15” pipes, and 500 feet for 18”-30” pipes. Change in flow direction at structures shall not exceed 90 degrees.

Local systems shall provide for containment of street flow from 10-year frequency storms within the parking lanes of the roadway without overtopping the curb. For streets without parking lanes the nearest driving lane to the curb shall be a minimum of 8 feet wide clear of encroachment from the 10 year flows.

Spacing of catch basins shall be as necessary for inlet capacity and as necessary to meet the street flow restrictions above, but in no case shall the spacing exceed 1000 feet on residential streets or 600 feet on collector and arterial streets.

Catch basins shall be located at intersections to prevent water from flowing across intersections (no valley gutters are allowed).

1005.6 Sizing Drainage Way, Open Channels

Open channels shall carry the 25-year frequency storm flow within the graded portion of the channel and the 100-year storm within the channel easement or right of way.

Channels may generally be lined with sod where 10-year frequency storm velocities are below the scouring velocity for the types of soils in the channel and where continuous flows do not exist. Lined low flow channels or storm sewers shall be provided for continuous flows or where the channel velocities exceed the scouring velocity.

Linings through developed or soon to be developed areas shall generally be concrete. Permanent turf reinforcement may be considered where there is both adequate light and continuous flows do not exist.

Concrete lining may be required by the City Engineer in residential areas where the channel slope is less than 2%.

1005.7 Storm Water Treatment Ponds

Design of permanent storm water treatment ponds shall conform to 1) applicable Minnesota Pollution Control Agency (MPCA) permit requirements, 2) the City of Rochester Department of Public Works “Grading Plan Checklist”, and 3) the City of Rochester Storm Water Management Plan.

1. Ponds shall incorporate multi-stage outlets as necessary to limit the 2-year, 10-year and 100-year peak discharges to less than the pre-development discharge. Outlets shall provide skimming of at least the 2-year event.

2. Ponds shall include a water quality "extended detention" hydraulic volume equal to the volume from 1/2" of runoff from the impervious portion of the developed watershed, per MPCA permit requirements. The extended detention volume shall be above the pond normal water level. When the pond water level is at the extended detention elevation, the discharge shall not exceed 5.66 cfs/acre of pond surface area. The discharge rate shall be adequate to draw down the extended detention volume in less than 48 hours, to prevent vegetation kill.

3. Ponds shall include a water quality "dead storage" quiescent settling volume at least equal to the developed pond watershed runoff from a 1.8" 6-hour rainfall event, per the Rochester Storm Water Management Plan. The dead storage volume shall be below the pond normal water level. The watershed 1.8" 6-hour runoff depth shall be interpolated from the following table, based on the developed pond watershed runoff curve number.

CN	66	68	70	72	74	76	78	80	82	84	86	88	90
Runoff (in.)	0.21	0.24	0.28	0.335	0.39	0.45	0.515	0.59	0.67	0.75	0.85	0.945	1.06

4. In addition to the dead storage water quality volume indicated above, the pond shall have at least the 20 year dead sediment storage volume (below the pond normal water level) per the following table:

Land Use	20 Year Sediment Vol. (Cu. Ft/Acre)
Low Density Residential	265
Medium Density Residential	343
High Density Residential	419
Commercial	497
Industrial	443

5. The pond plans shall include tabulation of the following data: Watershed Area (ac) *[total pond watershed including watershed of any upstream ponds]*; NWL Normal Water Level (ft); NWL Pond Surface Area (ac); NWL Pond Volume (a-f); 100-Yr High Water Level (ft); 100-Yr Bounce Volume (a-f); 100-Yr Peak Discharge (cfs); 10-Yr Peak Discharge (cfs); 2-Yr Peak Discharge (cfs); Dam Height (ft) *[toe of downstream side of dam to top of dam]*; and Maximum (Breach) Volume (a-f) *[at top of dam elevation, not including any volume below the elevation of the downstream toe of the dam]*.

Available references for pond design include:

1) "Protecting Water Quality in Urban Areas – Best Management Practices" published by the MPCA available at: http://www.pca.state.mn.us/water/pubs/sw-bmpmanual.html

2) NRCS Conservation Practice Standard 378, "*Pond*" available at: http://www.mn.nrcs.usda.gov/eng/standard/378mn.pdf.

1005.8 Grading Plan Checklist

The City of Rochester Department of Public Works "Grading Plan Checklist" is incorporated herein by reference.

1005.9 Subdrains

Subdrains shall be constructed on both sides of all urban street sections, unless otherwise approved by the City.

Drainpipe shall be a minimum of 4" in diameter and shall be constructed of perforated PVC Mn/DOT spec 3245. The pipe shall be completely wrapped with a geotextile fabric and bedded according to the detail plate.

Pipe slopes in subsurface drainage should be as appropriate for the design, with a minimum of 0.4 percent. Curved alignment of the subdrain is acceptable where the deflection angle of the alignment is not greater than 22.5 degrees, with not more than 2-22.5 degree fittings between structures.

Downstream outlet connections shall be made at elevations 0.5-feet higher than the lowest invert of the Storm Sewer Structure (typically a Catch Basin). If no structure is available, a cleanout shall be installed at the upstream end, consisting of two 45degree risers and enough length of pipe to raise the invert to finish grade. The cleanout shall be capped with a detectable PVC cap screwed to the pipe end.

A 4"x2" wye shall be installed at the same locations as the water and sewer service. Subdrain service connections shall be plugged at the property line or at the building site with a 2-inch detectable PVC cap

Section 1006 Service Connections

1006.1 Sizing Service Connections

A. Sanitary Sewer

Sizing of Sanitary Sewer services shall be 4" minimum.

All sanitary sewers shall be designed to have sufficient slope to provide mean velocities of 2 fps based on Manning's formula using an N factor of 0.013.

The minimum elevation of the service shall be established by using the elevation at the top of the main, or riser plus a 2% slope to a point one foot from the inside edge of the sidewalk to a minimum depth of 7.5 ft below boulevard elevation.

B. Water

Small water services are to be 1 inch, 1 1/2 inch or 2 inch inside diameters only. For common trench installation a vertical separation of 12" (minimum) is required. Water services are to be sized to provide the design flow rate while maintaining a minimum 20psi residual pressure at the last plumbing or process fixture connected to the service line. Rochester Public Utilities will provide static pressure and fire flow capacity information from a water distribution system computer model as an aid to water service line, interior plumbing, and fire sprinkler system designers. Designers are to anticipate water meter and required backflow preventer head losses in sizing water services.

If a water service is sized to serve a fire sprinkler system and domestic water consumption is anticipated to be small, construction of a separate small water service to provide for the domestic water service needs is recommended.

1006.2 Pipe Material

A. Sewer Service Pipe shall conform to the following:

1. Polyvinyl Chloride (PVC) Schedule 40 conforming to ASTM D 1785 (for use at building line only).

2. Polyvinyl Chloride (PVC) SDR 26 conforming to ASTM D 2241 (not permitted within 1 foot of footing).

3. Polyvinyl Chloride (PVC) SDR 35 or SDR 26 conforming to ASTM D 3034 (not permitted within 1 foot of footing).

4. Cast iron soil pipe and fittings shall be the "Service Weight, Centrifugally Spun" grade and shall conform to ASTM A74-75.

5. Ductile iron pipe shall conform to ANSI 21.51.

B. Water Service Pipe shall conform to the following:

Pipe 2" diameter or smaller is to conform to the requirements of ASTM B88 for Seamless Copper Water Tube, Type K, Soft Annealed Temper. Water services larger than 2" diameter are to be ductile iron.

Section 1007 Erosion Control

1007.1 Required Documentation

1. An "Erosion Control Plan" shall be incorporated into the construction plans & specifications and/or grading plan. The plan shall conform to the Department of Public Works "Grading Plan Checklist", applicable Minnesota Pollution Control Agency (MPCA) permit requirements, and "Protecting Water Quality in Urban Areas – Best Management Practices" published by the MPCA. The plan shall include adequate temporary and permanent erosion and sediment control measures.

2. The Owner and Contractor shall obtain an NPDES Storm Water Construction Activity permit from the MPCA, if required, and any other permits required.

1007.2 Construction Requirements

1. The construction shall comply with the project Erosion Control Plan and applicable MPCA permit requirements, shall be as necessary to prevent off-site sedimentation and tracking, and shall include final stabilization.

2. Best Management Practices (BMPs) for sediment control shall be established on all down-gradient perimeters before grading is commenced, and shall be regularly maintained and remain in place until final stabilization.

3. The Developer shall be responsible for cleaning and maintenance of the storm sewer system (including ponds, pipes, catch basins, culverts, and swales) within the subdivision and the adjacent off-site storm sewer system that receives storm water from the subdivision. If erosion and sediment control measures taken are not adequate and result in downstream sediment, the Developer shall be responsible for cleaning out or dredging downstream storm sewers and ponds as necessary, including associated restoration. The Developer shall follow all instructions it receives from the City Engineer concerning the cleaning and maintenance of the storm sewer system. The Developer's obligations under this paragraph shall end two (2) years after the public improvements in the subdivision have been accepted by the City Engineer.

4. The Developer shall be responsible for cleaning all streets in the subdivision and adjacent to the subdivision from silt and dirt from the subdivision for a period of two (2) years ending when the streets have been completed and accepted by the City Engineer.

5. All permanent storm water ponds shall be cleaned to original plan cross-section after final stabilization, and (if applicable) prior to final acceptance by the City Engineer.

1007.3 Temporary Erosion Control

Temporary erosion control includes the placement or construction of berms, ditches, sediment basins, fiber mats, fabrics, hay bales, seeding or other devices that are necessary to prevent soils and sediment from entering public waters, sewers, streets and adjacent properties. These temporary control measures include their eventual removal after conditions stabilize.

At a minimum all drainage ways shall contain ditch checks and all storm water inlets shall be screened with hay bales or erosion fence to prevent soils and sediment from entering the systems. At all locations where soils and sediment may erode and enter public improved streets, positive erosion control measures shall be taken to prevent the materials from entering the streets.

Contract pay items shall be provided for erosion control items and significant elements such as the construction of berms or ditches and the placement of ditch checks shall be shown on the plans.

1007.4 Permanent Erosion Control

Permanent erosion control includes the placement or construction of berms, ditches, sediment basins, fiber mats, sod, seed and mulching necessary to prevent soils and sediment from entering the public waters, sewers, streets and adjacent properties.

Contract pay items shall be provided for permanent erosion control items.

Section 1008 Standard Plans

1008.1 General

In order for the City to have standardized construction plans and record drawings, the City follows the Mn/DOT CADD Data Standards with the exception of AutoCAD file formats being substituted for Microstation files. The AutoCAD file versions used by the City is to ensure consistent data aggregation, element symbology, object usage, and locational accuracy of project CADD data that effectively enables:

1) Project data to be shared among functional business units in an integrated manner throughout the project design process.

2) CADD data to be accessible for use in specialized non-design project design process.

3) Engineer's electronic deliverables to concur with City design policies.

The Sample Plan section depicts what our product should look like and provides guidance to those roadway designers preparing the individual plan sheets for roadway construction projects.

The Sample Plan is made up of individual plan sheets, narratives and checklists. The plan sheet shows a sample of what each sheet should look like. The narrative section provides a list of references and general information relative to that sheet. The checklist provides a quick final check off of appropriate information to be included on that sheet. The designer should use both the narrative and checklist while preparing the plan sheets.

The Sample Plan also has a General Information section that offers more general, less sheet specific, guidelines for preparing a roadway construction plan.

The location of the web site is: http://www.dot.state.mn.us/caes/cadd/

1008.2 Modifications to the Mn/DOT Sample Plan

In addition to the guidelines set forth by the Sample Plan, the guidelines listed below shall be followed:

A. General

All sheets shall be reproducible on standard D-size sheets (22" x 34"). Scale 1" = 20' where there are more than two underground facilities (i.e. sewers, watermains, subdrains) or sheets that are otherwise be crowded due to curvature, etc. On large simple detail plans a scale of 1" = 40' can be used.

All parcels shall be properly labeled with lot and block numbers and plat name, or Parcel Identification Number (PIN) in unplatted areas. Developed parcels shall have their address shown on the plan.

Existing utilities shall be shown in both plan and profile, labeled with stationing as existing.

All match-like breaks shall be clean with reference points clearly marked. All plans, which are broken by a match line, shall be on the same or consecutive sheets.

All sewer and watermain shall be shown in the profile with the appropriate information such as size, material, grades, invert elevations, etc.

B. Title sheets

Provide signature block for RPU-Water Division (if plans include watermain), Manager of Engineering and Director of Public Works.

C. Grading and Paving Plans

Provide elevations at 25' intervals for property lines, top of curb, centerline, all lot corners on property line, all curb returns and mid points, and intersection layouts.

Plot top of curb profiles.

Typical sections including structural section to be shown on the Title Sheet, Detail Sheet or Plan View.

D. Sewer, water and service connection plans.

Identify fittings and structures on the plan view as follows:

(a) Sanitary Sewer ..... M.H. No. 1, M.H. No. 2, etc.
(b) Watermain ..... W-1, W-2, etc.
(c) Storm Sewer ..... M.H. S-1, S-2, CB No. 1, CB No. 2, etc.
(d) Subdrains ..... M.H. SD-1, SD-2, etc.

Notes for fittings and structures shall include the station and relationship to centerline. For structures, also provide the structure type, diameter, casting type, ring and center of invert elevation for inlets and outlets in the notes. Provide the center invert grades on the profile, along with pipeline grades at 25ft intervals.

All hydrants are to be at required height (see Standard Plates) after lawns, boulevards, etc. are finished (sod, seed, etc.) This will be the contractor's responsibility. Provide break-off elevations on hydrants.

All sanitary sewer services shall be drawn on the plan to the intended location. The station of the wye, the station and invert elevation of all sanitary sewer services at the end of the service in the boulevard, and the boulevard elevation at the service shall be shown on the plans. If risers are installed, the height of each shall be indicated on the plans and also drawn on the profile.

The size and type of all sanitary sewer and water services shall be noted on the plans. Service connections shall be centered on the lots and shall terminate one foot from the sidewalk. A curb stop and box shall be placed at the end of the water service. The linear dimension from the property line to the service connection shall be shown on the record drawings.

E. Sidewalk and Bikeway Plans

Show sidewalk or bikeway as construct or future, with widths and distance from property lines on plan views.

Sidewalks with handicap accessible ramps shall be placed within the curb return area at all intersections, except roundabouts / traffic circles.

Section 1009 Submission of Plans

1009.1 Plans and Specifications

1. Submit one set of plans & specifications to the Public Works Manager of Engineering for review and comment. If the project includes watermain construction, also submit one set of plans & specifications to Rochester Public Utilities (RPU) Water Division for review & comment.

2. The Consultant shall obtain a Minnesota Department of Health permit for watermain extensions and a Minnesota Pollution Control Agency permit for sanitary sewer extensions.

3. After approval by the Director of Public Works, submit the electronic files together with six sets of final plans & specifications to the City Engineer; two of the plan sets may be reduced (half size) plans. The Department of Public Works will forward copies to the RPU Water and Electric divisions.

4. For publicly bid contracts, furnish an additional 24 sets or as needed.

1009.2 Estimates

Use standard bid items as published by the Department of Public Works for all publicly let contracts. As Built quantities shall be provided with the record drawings.

For public contracts furnish: specification number, six (6) digit extension code, item description, unit of measure, quantity and estimate of cost (including cost split if any) to the City Engineer for preparation of the Form of Proposal including the Engineer's Estimate and Schedule of Prices.

1009.3 City-Owner Contracts

1. Submit the City-Owner Contract Request form to the Public Works Land Development Section. The Public Works Department staff will prepare and return a Contract for execution within 7 business days.

2. Submit the Contract executed by the Owner & Contractor, the bond, and certificate of insurance to the Public Works Land Development Section at least 10 business days before the City Council meeting at which the Contract will be considered (meetings are normally every 1st & 3rd Monday of the month).

3. Not later than the Wednesday of the week preceding the City Council meeting,

(a) The plans & specifications must be approved and six copies submitted,

(b) Any associated grading plan and drainage plan must be approved,

(c) The Owner must have signed a Development Agreement, if required, for the project, and

(d) The Owner must have filed the Final Plat or Site Plan with the Planning Dept.

1009.4 Electronic Drawings

The Consultant shall verify and submit an electronic drawing file for the entire plan set, and shall contain an overall plan view drawing containing control point coordinate information accurately referenced to Olmsted County Project Coordinates (NAD 27, or NAD83 coordinate base).

For projects with watermains, in addition to providing the required information to Public Works Department, a copy of this file shall be provided directly to Rochester Public Utilities (RPU).

The drawing set shall consist of all related support files required to reproduce the electronic drawing file, as a hard copy, in the current City AutoCAD format. Support files required by the City will include any font files (*.shx) not supported by AutoCAD, external reference drawings (AutoCAD Xref), and plot configuration files (*.pcp, *.pc2, *.pc3…etc.). If software license agreements do not allow distribution of third party support files, then an AutoCAD supported equivalent shall be substituted prior to delivery to the City.

It is required that all files be in AutoCAD™ format. Formats, translations, etc., and the accuracy of data contained therein will be the total responsibility of the contracted source. The files delivered under contract must work in the AutoCAD™ environment as described above with no adjustments, modifications, translations or alterations while retaining all required element properties.

1009.5 Record Drawings

All record drawings shall be submitted in electronic (AutoCAD) format and on D-size Mylar prints. The plans shall be clearly legible drawings with unnecessary construction information removed (contours, trees, shrubs, fences, etc.). Place proper notes and statements, (i.e. type of alternate pipe used) on all sheets. All hydrants shall have benchmarks on them.

Record drawings on all public and private stormwater management ponds and drainage conveyance facilities are required. Plans shall indicate finished contours at two (2) foot intervals, normal water elevation, high water elevation, and the acre-feet of storage for each ponding area along with the final storm sewer plans.

The record drawing plans shall be submitted to the City Engineer within 3 months of the initial acceptance/commencement of the warranty period. Failure to submit the record drawings within the required 3-month period may result in an extension of the project warranty period for a length of time equal to the delinquency in plan submittal.

Section 1010 Construction Supervision

1010.1 Pre-Construction Conference

As soon as possible after the project has been approved, the Engineer should arrange a conference with the contractor and all other interested parties for the purpose of reviewing contract requirements, construction details, work schedules and any items peculiar to the project. Prior to this meeting the Engineer and all key inspectors and the survey crew chief should study the plans and become familiar with the project site to be well informed as to the requirements and existing conditions. Notify the City Engineer of the time and place of the pre-construction meeting.

1010.2 Notice to Proceed

The City Engineer will issue a "Notice to Proceed" after the City has executed the City-Owner Contract (for privately let contracts) or the construction contract (for publicly let projects).

1010.3 Surveying

Surveying work includes: complete staking during construction, diaries and survey notes, final benchmarks on hydrants, etc.

1010.4 Inspection

Engineering supervision ensures completion of construction contracts according to contract requirements; provides technical supervision for construction projects; coordinates the activities of public utilities, contractors, and other governmental agencies on construction projects; documents contract work progress for payment of the contractors; keeps property owners, news media, other governmental agencies, and the public informed of construction operations within the area; provides requested technical assistance to other governmental agencies on their construction projects; and advises contractor of traffic safety and control measures. Maintains field records for record drawings.

1010.5 Utility Testing

1. Watermain Testing. Coordinate watermain loading, pressure testing, conductivity test, bacteria testing, and visual inspection on valves and hydrants with the RPU Water Division. Only RPU personnel shall operate valves and hydrants and perform visual inspection on valves and hydrants.

2. Sanitary Sewer Testing. Observe the test and submit the certification of sanitary sewer air & deflection testing and request for televising to the City Engineer. The City Engineer will schedule televising by City forces. Sanitary sewers will generally not be televised until the bituminous base has been placed and the castings are set to final grade.

1010.6 Detailed Stage Inspections

The Engineer shall notify the City Engineer 48 hours prior to "stage inspections." The inspections will be performed in the presence of the Contractor, the project Consulting Engineer, and Public Works Department personnel. Inspections shall be performed at the following construction stages, unless otherwise indicated in the Contract. Submit the required material test reports to the City Engineer prior to or at the respective "stage inspection." Any areas failing the stage inspection must be corrected and re-tested for compliance prior to re-inspection.

1. Subgrade Preparation. Visual inspection of soils and conditions. Test rolling – one pass of a 7-ton per axle vehicle in each travel lane and parking lanes; one wheel shall be within the curb section during the parking lane pass. Prior to the inspection, submit test results to the City Engineer for utility trench compaction, embankment compaction, and subgrade compaction.

2. Aggregate Base. Visual inspection of compaction. Test rolling as above, except no deflection allowed. Prior to the inspection, submit test results for aggregate quality, aggregate gradation, and aggregate compaction. Submit base course bituminous trial mix design to the City Engineer prior to paving.

3. Bituminous Base and Concrete Curb & Gutter. Visual inspection for settling and cracking. Prior to the inspection, submit test results for concrete tests of the curb, bituminous aggregate quality, and bituminous base compaction/Marshall. Submit wear course bituminous trial mix design to the City Engineer prior to paving.

The City's approval of various stages of the project work shall not constitute an acceptance of the work or the project, and the contractor shall be liable for defects due to faulty construction until the entire work under the Contract or City-Owner Contract is finally accepted by the City as stipulated in the Contract or City-Owner Contract.

1010.7 Acceptance

1. Project Construction Record. Submit to the City Engineer the Project Construction Record, the material (e.g. pipe) certifications, material test results for bituminous wear course, and any other items listed in the Project Construction Record not previously submitted.

2. Engineer's Certification of Acceptance. After all Contract construction is complete including corrective work identified by the Engineer, submit the Engineer's Certification of Acceptance, with Part 1 complete, to the City Engineer. The City will inspect the project and either:

a) process the initial acceptance and commencement of the warranty period (Part 2 of the form), or

b) return the Engineer's Certification with instructions for corrections in the work.

3. Record Drawings. Electronic and Mylar record drawings shall be submitted as in section 1009.

4. Warranty Work. Prior to the end of the two-year warranty, the City Engineer will inspect the project and provide instructions for corrections, if any. Notify the City Engineer when all corrections have been made.

5. Final Acceptance. Upon expiration of the warranty and completion of all corrections, the City Engineer will process Final Acceptance (Part 3 of the Engineer's Certificate of Acceptance) and provide a copy to the Owner, Contractor, and Engineer.

Section 1011 Schedule of Materials Control

1011.1 General

The table below outlines the minimum required rate of sampling and testing for major construction items:

Material	Spec. No.	Minimum Required Acceptance Testing	Test Taken
Backfill Materials	T100, C150	1 / Source	Gradation
Embankment	2105	1 / 1000 cu yds (CV)	Moisture, Relative Density
Subgrade	2112	1 / 500' Block	Moisture, Relative Density
Longitudinal Trenching	T100, C150	1 / 300 ft/ 2' depth	Moisture, Relative Density
Transverse Trenching	T100, C150	1 / 2 trenches / 2' depth	Moisture, Relative Density
Aggregate Base	2211, 3138	1 / Source	Quality (LAR, Insoluble Residue)
		1 / 1000 ton or 500 cu yd (CV)	Gradation
		1 / 500 ft Block	Relative Density
Bituminous Materials	2331,2350	Use Mn/DOT Job-Mix-Formula	Proof roll prior to placement
Aggregates		1 / Mixture Blend	Gradation
		1 / Aggregate Type	Quality (LAR, Mag. Sulfate, Insoluble Residue)
Mixtures		1 / Mixture Blend/Day	Extraction/Gradation
		1 / Mixture Blend/Day	(% Air Voids)
Compaction		1 / 500 ft Block	Modified Specified Density
Concrete		Use Mn/DOT Mix-Proportions	Proof roll prior to placement
Aggregates	3126, 3137	1 / Source / Day	Gradation, Quality (LAR), Mag. Sulfate
		1 / Source	
Air Content		1 / 50 cu yd/ Day	(% Air Voids)
Slump		1 / 50 cu yd/ Day	Inches
Cylinders		1 / 100 cu yd/ Day	Compression (psi)

All test reports are to be delivered to the City of Rochester Public Works Department.